Airspace Systems Program

Socio-Economic and Demand Forecasting

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Objective

- The NASA Aeronautics research program has increased its emphasis on ATM technologies in response to heightened national needs. (VAMS)
- NASA is considering programs to develop technologies for an advanced NAS.
- However, it is necessary to have a solid understanding of the broader economic environment in which those technologies will operate.
- A more complete understanding of the potential environments in which NASA research will operate enables solutions that are robust under a wide variety of conditions.

Problem Definition

- In order to develop a research program that will provide demonstrable benefits to taxpayers, travelers, and industry, the Airspace Systems (AS) program needs to understand how national economic conditions, demographic trends, and other factors affect the Nation's need for transportation, and air transportation in particular.
- This includes the traditional factors (such as price, population, GDP, and demographics - as well as new security concerns) and how they will affect the need for NASA sponsored research.

Study Approach

- The focus of this study will be to develop an understanding of the role of transportation in general and air transportation in particular within the U.S. economy, the major determinants of the demand for air transportation, and how an intermodal perspective may affect our understanding of air travel demand.
- The principal mechanism for developing this understanding will be the definition of a set of operational-level scenarios that depict the potential future environment for the global air transportation system. These scenarios will include economic conditions, security considerations, airport and airspace capacity, and the global political environment.
- More detailed descriptions of the impacts of these operational-level scenarios will be developed, in terms of their effects on air travel demand volume and its distribution.

Supporting Organizations

- LMI
- GRA
- Volpe National Transportation Systems Center
- Affiliated consultants and universities

Currently engaged in a 6-month effort

Develop Transportation Scenarios

The Future is Uncertain.
Technology lead times can be long.
Conditions are likely to change.

- Identify driving forces
- Determine their potential variation
- Create scenarios spanning the variables
- Examine the resulting scenarios and select a subset for detailed study
- Study system trends for the selected scenarios, evaluate costs, and assess risk factors

Limited resources must be allocated to areas that are most likely to achieve success in scenarios with the greatest probability of being realized.

Limits and Uncertainties

- Focus on a limited number (4 to 6) of highly plausible operational scenarios rather than attempt to address every possible scenario.
  - When selecting the scenarios for detailed study, care will be given to generate a variety of orthogonal scenario variables.
- Forecasting the future becomes increasingly hard as the time horizon is extended.
  - Consequently, we will focus on a 20 year forecast (i.e. 2022)

Three Part Effort

- Describe the current state of knowledge on the relationship between transportation and the economy and how that affects the NASA airspace systems research program.
- Review the previous scenarios to include those developed for NASA by the National Research Council ("Scenario-Based Strategic Planning for NASA's Aeronautics Enterprise"), and revise, update, and expand them as required to reflect current and future conditions.
- Develop a set of demand forecasts, incorporating both aggregate travel volumes and its distribution among airport-pairs and air vehicles, for each of the defined scenarios. Develop a schedule of commercial and GA flights for each of the scenarios.

Activity One

- Conduct literature search of past studies:
  - Generate insights into the interdependence of the broad economic environment, the role of transportation, and NASA's airspace systems research
- Examine usage of air transportation by sectors of the economy:
  - Identify sectors that are largest users of passenger and cargo air transportation
  - Identify sectors that are particularly dependent on air transportation in terms of input costs

Air Transport and the Economy

- Catalog and assess existing models:
  - ASAC Air Carrier Investments Model (ACIM)
  - ASAC Air Carrier Cost-Benefit Model (CBM)
  - National Aeronautics Cost-Benefit Analysis Model (NACBA)
  - Population and employment demographic models
  - Mode choice models
  - Economic impact models
  - others
- Identify strengths and weaknesses of economic models and their measures:
  - Measures that appeal to technical audiences (e.g. CBO, GAO, OMB, etc.)
  - Measures for lay audiences

Activity Two

- Review external aviation forecasts
- Develop market segments of interest
- Identify demand drivers
- Identify supply issues
- Align demand with scenarios
- Input to Activity 3

Review External Aviation Market Forecasts

What are the smart people saying?

- Boeing
- Airbus
- FAA
- IATA
- ICAO-FESG (Finance and Economic Sub-Group)
- Others

Forecasts ranging in scope from 10 to 50 years

Aircraft Market Segments

- Regional
  - GA
  - Rotary
  - Turbo Prop
  - RJ
- Mainline
  - 100, 150, 200, 300, 400+ seat
  - Conventional subsonic
  - High speed subsonic
- All cargo
- other

Demand Drivers

- Economic growth
- Full price of travel:
  - Access and travel times
  - Access and travel costs
  - Access and travel schedule availability
  - Relative attractiveness of competing modes

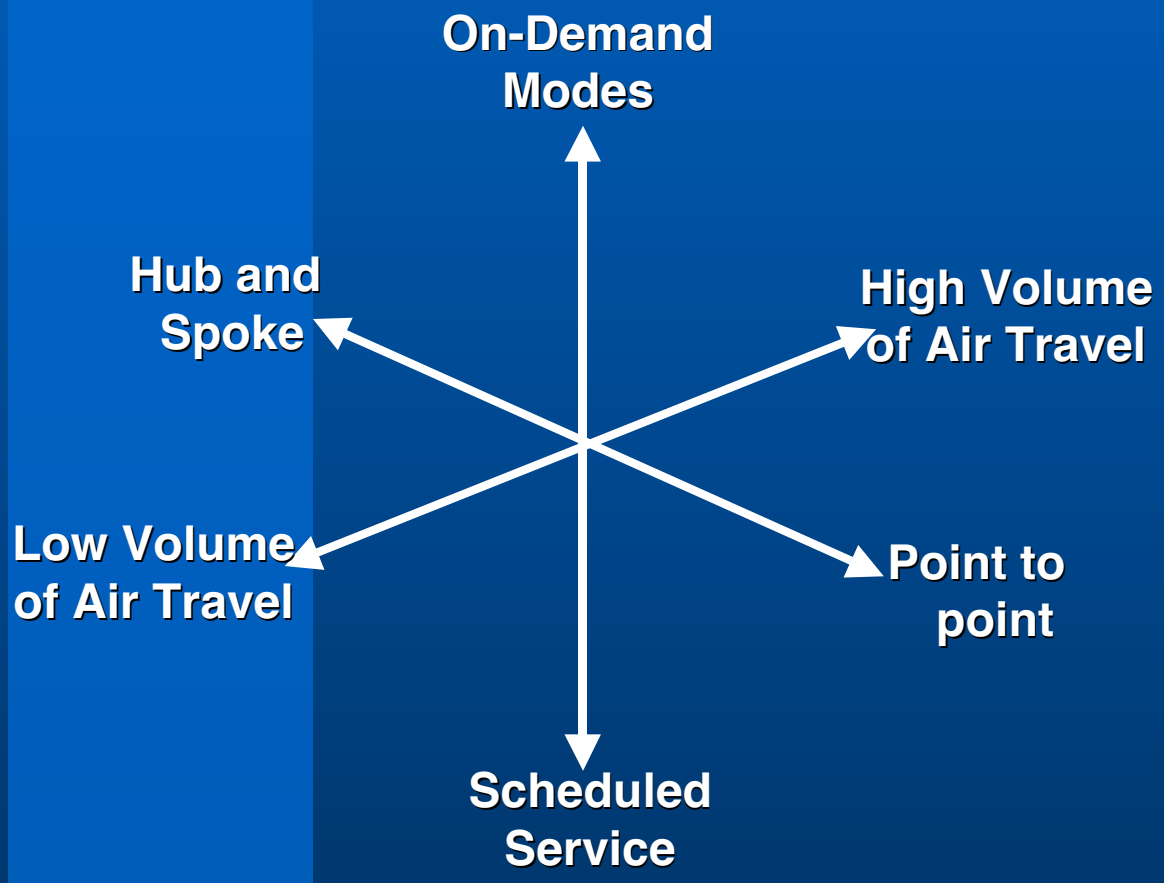
Supply Issues

- Congestion/delay
- Security/risk perceptions
- Security time and money costs
- Fuel costs
- Air navigation service/airport charges (high fixed cost)

Align Demand to Scenarios

- Travel market segments:
  - Domestic/international
  - Business/vacation/visit friends and relatives
  - Cargo/passenger
  - Scheduled/on-demand
  - others
- Scenario issues
  - Passenger growth
  - Cargo growth
  - Environmental limits
  - Fuel price shocks
  - World tensions
  - others

Activity 3:
Axes of Interest



Parameter Definitions

- Volume of Air Travel is a function of overall health of economy, demographic trends, security issues, and relative attractiveness of competing surface modes.
- Scheduled versus On-Demand attribute measures the degree to which scheduled air carriers satisfy air travel demand versus GA, SATS, etc.
- Hub and Spoke versus Point to Point attribute measures the degree to which passengers travel directly from their true origin to their true destination.

Traffic Schedule Inputs

- Commercial traffic:
  - Time-of-day patterns for both airports and O&D markets and the simulated airline operation strategies for schedule generation
- GA:
  - Based on SATS modeling work
  - Terminal operation forecast, distance profile, and the gravity model for the O&D demand
- Cargo
  - TBD

Outputs from Activity Three

- A set of airport demand forecasts for each of the scenarios defined under activity two:
  - Commercial flights by airport-pair
  - GA flights by airport-pair
  - Cargo flights by airport-pair

Follow-on Activities

- Identify institutional factors and societal concerns affecting changes in the aviation system
- Identify inhibitors to system improvements